

# Behavior Modification and Risk Perception in Patients with Nonmelanoma Skin Cancer

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## ABSTRACT

**Context:** Nonmelanoma skin cancer (NMSC) is the most common cancer among humans, yet risk perceptions and preventive health behaviors in those who survive this cancer are relatively unknown.

**Objectives:** To assess the impact of the disease and its treatment on sun-protective behaviors, general preventive health behaviors, and risk perception in NMSC patients, and to determine factors associated with behavioral change.

**Design and Setting:** A prospective study was conducted of 211 consecutive NMSC patients presenting to a dermatologic surgery clinic at a tertiary care university medical center from February 2005 to March 2006. These patients were all adults, were fluent in English, and had NMSC of the head and neck. Of the 211 eligible patients, complete data was obtained for 183 (87%). The most common reasons for dropout were voluntary withdrawal and incompletely answered surveys.

**Intervention and Outcome Measures:** Surveys that assessed disease-specific quality of life (QoL), preventive health behaviors, sun-protective behaviors, and risk perception were administered before and after surgical treatment of NMSC.

**Results:** Sun-protective behaviors improved post-surgery even after controlling for seasons ( $P < 0.001$ ). Predictor factors associated with increased sun-protective behavior included poor skin tanning ability, summer season, no employment, less comorbid conditions,

and previous NMSC treatment. Baseline QoL was not predictive of behavioral change. As for risk perception, respondents thought they were more likely than someone similar to themselves to develop future NMSCs but thought they had similar risks of developing melanoma or other non-skin cancers ( $P < 0.001$ ).

**Conclusions:** NMSC patients demonstrated disease-specific behavior modifications by selectively improving their sun habits but showed no significant improvement in other preventive health behaviors. This finding is consistent with patients' specific perception of increased risk for future NMSCs, but surprisingly, not for melanoma. Increased patient education of associated cancer risks with NMSC is warranted.

## INTRODUCTION

Skin cancers are the most common malignancies in human beings, accounting for approximately 50% of all cancers. The American Cancer Society estimates there are at least as many nonmelanoma skin cancer (NMSC) cases diagnosed each year as all other cancers combined (more than 1 million cases per year).<sup>1</sup> Exposure to UV light is the primary risk factor associated with NMSC. The likelihood of individuals to participate in sun-protective behaviors (wearing protective clothing, avoiding the sun, using sunscreen, and skin self-exams) is associated with other behaviors of a healthy lifestyle.<sup>1</sup>

Epidemiologic evidence has suggested that NMSC patients are at risk for not only future NMSCs, but also for developing other malignancies, such as cancers of the buccal cavity, salivary glands, and lungs, as well as lymphoma, leukemia, and melanoma.<sup>2-6</sup> The shared risk factor—UV light exposure—is thought to be the causal link for a 3-fold increase in the risk for malignant melanoma for NMSC patients.<sup>4</sup> However, the association between NMSC and other noncutaneous malignancies—15%-30% higher than expected compared to the general population—remains more perplexing in its causal link and remains a controversial topic.<sup>5,7</sup>

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In addition, although NMSC is not life-threatening, the disease has been shown to negatively impact patients' quality of life (QoL).<sup>8-9</sup> Given the conspicuous location of NMSC lesions, issues related to disfigurement, depression, anxiety, and embarrassment have all been shown to be relevant for NMSC patients.<sup>9</sup> The fear of developing future cancers and the effect of the disease and/or its treatment on social interactions and body image may motivate patients to undertake strategies of primary cancer prevention such as sun-protective behaviors, smoking cessation, improving diet, and other preventive health behaviors.

In the context of this potential vulnerability, we wanted to assess the current state of cancer risk perception and participation of general preventive health behaviors in this patient population, and to determine if risk perception or behavior would change following treatment of NMSC. Furthermore, we hypothesize that NMSC patients would be more likely to change their sun-protective behavior following treatment of their skin cancer and that baseline disease-specific QoL would be a significant predictor for behavioral change.

## METHODS

The study period—consisting of enrollment, treatment, and follow-up—spanned 13 months (February 1, 2005 to March 2006). The sample included 211 patients who had biopsy-proven NMSC and were referred to a dermatologic Mohs surgery clinic at the Medical College of Wisconsin. All participants were of sufficient physical and mental capacity, were adults, and were fluent in written and spoken English. Participants with major psychiatric illnesses or cognitive impairment were excluded. Of the 211 eligible patients, complete data was obtained for 183. The most common reasons for drop-out were voluntary withdrawal and incompletely answered surveys.

At the initial visit, a trained research nurse explained the research study to the participants and obtained an Institutional Review Board-approved informed consent. All enrolled participants completed the survey before interaction with the physician. Surveys were administered again at a 4-month follow-up appointment, with participants completing the survey prior to interaction with the physician. The 4-month endpoint was chosen because this was when the majority of the postoperative healing process has finished—ie, it was possible to evaluate the “final” postoperative result. If the patient was not able to make the scheduled appointment, the survey was sent with a self-addressed stamped envelope

to a home address. Three attempts were made to contact the participant to fill out the follow-up survey.

## Measures

Demographic, clinical, and sun-protective behavioral information was collected. Demographic variables included age, gender, marital status, education level, and socioeconomic status (employment and income). Clinical variables included type of cancer, location of lesion, number of different locations, histology, previous treatment, existence of comorbid conditions, and reconstruction technique (Table 1).

Each patient completed the survey before and after surgery. The survey measured patient perception of risk (3 questions), general preventive health behaviors (5 questions), sun-protective behaviors (5 questions), and other sun habits and perceptions (5 questions). Review of the literature and clinically relevant questions led to the survey's contents. Responses were recorded on a 5-point Likert scale. Baseline QoL was assessed using the Skin Cancer Index (SCI), a recently validated disease-specific instrument for patients with NMSC.<sup>8</sup> The SCI is a 15-item, disease-specific QoL instrument with 3 subscales—emotional, social, and appearance. The SCI total score was used as the predictor variable, with potential analysis of the subscale scores pending significance of the total score.

## Data Analysis

For the sun-protective behavior questions, Cronbach's alpha was computed, along with item total correlations and correlations between any 2 questions. This determined whether the questions reasonably formed an instrument describing the characteristic in aggregate. Sun-protective behaviors of patients were use of sunscreen, avoiding the sun during peak hours, seeking shade, wearing a hat, and wearing sun-protective clothing. A univariate comparison of pre- and post-surgery outcomes was performed using the paired t-test for each question. *P*-values were computed using the paired t-test. Multivariate analysis was performed using mixed models for repeated measures data, with several between-subject factors and 1 within-subject factor of time (2 levels: pre- and post-surgery). Between subject factors included demographic factors (age, employment, gender, marital status, educational attainment, income), clinical factors (location of lesion, reconstructive technique), QoL as measured using the SCI, skin tanning ability, and the season at which the survey was completed. Assumptions of mixed models including normality of sampling distributions and homogeneity of

**Table 1.** Descriptive Data for Sociodemographic and Medical Characteristics

Variable Level	N	%
Overall	183	—
<b>Gender</b>		
Female	93	51
Male	90	49
<b>Race</b>		
Caucasian/White	182	99
American Indian/Aleut/Eskimo	1	1
<b>Age Median (63) Range (21-85)</b>		
≤65	95	52
>65	88	48
<b>Education</b>		
High school or less	46	25
Vocational school or some college	48	26
College degree	57	31
Professional or graduate degree	32	17
<b>Marital Status</b>		
Married/Live-in partner	140	77
Other	43	23
<b>Income</b>		
≤\$50,000	61	33
>\$50,000	113	62
Missing	9	5
<b>Job Status</b>		
Full-time	67	37
Part-time	18	10
Self-employed	14	8
Retired	63	34
Homemaker	16	9
Other	5	3
<b>Location of Lesion</b>		
Nose	56	31
Lips	16	9
Eyelid	23	13
Ears	18	10
Cheek	25	14
Forehead	18	10
Temple	11	6
Neck	1	1
Scalp	7	4
Other	29	16
<b>Histology</b>		
Basal	164	90
Squamous	16	9
Other	3	2
<b>Previous Treatment</b>		
None	115	63
Same site/recurrent	23	13
Other site	45	25
<b>Comorbidity</b>		
Present	154	84
Absent	29	16

variance-covariance matrices were checked and deemed adequate. Least squares estimates of means for main effect variables (no interaction with time) were provided with 95% confidence intervals, and a *P*-value testing the main effect. For variables having significant interaction with time, least squares estimates of means and 95% confidence intervals were calculated both pre- and post-surgery for each level of the variable.

## RESULTS

The median age was 63 years, with a range from 21 to 85. Gender was split almost evenly: 93 females (51%) and 90 males (49%). Basal cell carcinomas were found in 90% of the sample (*n*=164), squamous cell carcinomas were detected in 9% (*n*=16), and 2% (*n*=3) had other types of lesions. More lesions (*n*=104) were located on the nose (56 patients [31%]), cheek (25 patients [14%]), and eyelid (23 patients [13%]) than other areas of the face, neck, or scalp. Other descriptive statistics for participants' demographic and clinical characteristics are shown in Table 1.

Responses to questions measuring perceived risk of developing cancer were consistent both pre- and post-surgery (Figure 1). On average, respondents rated the likelihood of developing another basal or squamous skin cancer within the next 10 years compared to someone of the same age, race, and gender to be "somewhat likely." Patients revealed their perceived chance of developing a melanoma to be "about the same" as someone of similar demographics. Likewise, patients thought their risk for developing a non-skin cancer was "about the same." However, patients expressed belief that they were at higher risk for developing another NMSC compared to other cancers (*P*<0.001). For all 3 risk perception questions, there was little change in pre- and post-surgery responses in the univariate analysis, indicating that, in general, patients retained the same view of their personal risk of developing cancer.

Collectively, sun-protective behaviors significantly improved following surgery (*P*<0.001) (Table 2). The 5 sun-protective behavior questions, as an aggregate, demonstrated reasonable internal reliability (Cronbach's alpha=0.7, pre-surgery and post-surgery). Therefore, the aggregate score was used as the marker of sun-protective behavior for the univariate and multivariate analyses.

In the univariate analysis (Table 3), among the preventive health behaviors, only the participation in self-exams for skin cancer appeared to be significantly increasing post-surgery (*P*<0.001). In the multivariate analysis, predictor factors associated with increased

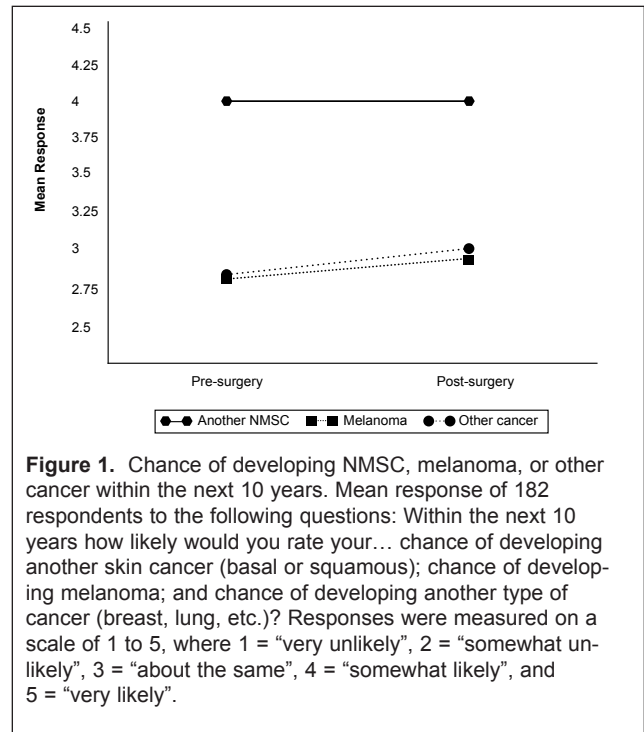
sun-protective behavior included poor skin tanning ability, summer season, no employment, less comorbid conditions, and previous NMSC treatment (Table 4). More specifically, participants who were not in the workplace had similar sun-protective behavior before surgery compared to those who were employed. However, those participants who were not employed demonstrated greater positive change in their sun-protective behavior. Also, participants who had no previous NMSC had significantly poorer baseline sun-protective behavior scores. This trend continued even after surgery, but the gap closed to some degree.

Baseline mean (confidence interval) SCI total score was 68.3 (65.2, 71.4). When baseline SCI total score was included as a predictor variable in the multivariate analysis for sun-protective behaviors, it was not significant either as a main effect ( $P=0.632$ ) or as a predictor variable comparing before and after treatment ( $P=0.556$ ).

**DISCUSSION**

We have demonstrated that NMSC patients improve sun-protective behaviors after surgery but show little change in non sun-related preventive health behaviors, some of which may be putting them at risk for other cancers. Although NMSC patients in this study received no specific counseling on sun exposure or skin cancer prevention, they exhibited a significant increase in post-surgical use of sunscreen, hats, and sun-protective clothing. This finding is consistent with past studies.<sup>10-12</sup> Additionally, they were more likely to stay in the shade, avoid the sun during peak UV emissions, and they increased the frequency of post-surgical skin self-exams. These behavioral changes are consistent with the risk perceptions of this patient cohort and the Health Belief Model.<sup>13</sup> The Health Belief Model indicates that a health behavior change is more likely in individuals who perceive themselves to be at risk for a health problem, perceive the consequences of the illness to be severe, perceive many benefits to carrying out preventative actions, and perceive few barriers to assuming these actions.

Certain demographic and clinical factors were identified that correlated with greater compliance or change in sun-protective behavior. Patients who were previously treated for NMSC reported significantly greater pre- and post-surgery participation in sun-protective behaviors as compared to patients treated for the first time. Although first-time NMSC patients also showed significant improvement in their sun habits following surgery, previously treated patients showed more improvement. This suggests that patients with prior



**Figure 1.** Chance of developing NMSC, melanoma, or other cancer within the next 10 years. Mean response of 182 respondents to the following questions: Within the next 10 years how likely would you rate your... chance of developing another skin cancer (basal or squamous); chance of developing melanoma; and chance of developing another type of cancer (breast, lung, etc.)? Responses were measured on a scale of 1 to 5, where 1 = “very unlikely”, 2 = “somewhat unlikely”, 3 = “about the same”, 4 = “somewhat likely”, and 5 = “very likely”.

history of NMSC perceived themselves to be at higher risk for skin cancer than first-time NMSC patients, which likely motivated them to further change harmful sun-related behaviors. The higher risk perception by these patients is corroborated by studies that have demonstrated an increased risk for future NMSCs. In a meta-analysis from 2000, it was estimated that the average proportion of patients developing a subsequent basal cell carcinoma or squamous cell carcinoma within 3 years was 44% and 18%, respectively.<sup>2</sup> Additionally, the risk for a subsequent NMSC has been shown to be strongly associated with the number of previously diagnosed NMSCs.

Along with previous treatment, absence of any comorbid conditions also correlated with increased sun-protective behaviors. It is possible that patients with other comorbid conditions were less likely to improve their sun habits because they were more concerned with medical conditions other than NMSC.

Employed patients were less likely than those who were retired, homemakers, or unemployed to partake in sun-protective behaviors following surgery. There are a few possible explanations for this finding. First, people in the workforce tend to be younger than retirees, who make up 75% of unemployed patients in this study. Previous studies have shown that younger patients (age 15-45) are less likely to engage in skin cancer prevention than older adults.<sup>14</sup> Second, employed patients tend to find themselves in social situations more often than their

**Table 2.** Sun-Protective Behaviors Before and After NMSC Treatment<sup>a</sup>

Variable	Pre-surgery		Post-surgery		P-value
	Mean	SD	Mean	SD	
Sunscreen use	3.16	1.47	3.34	1.38	0.087
Limit time in sun 11 AM–3 PM	2.79	1.34	3.33	1.34	<0.001
Shade	3.10	1.16	3.34	1.10	0.007
Hat	3.26	1.43	3.56	1.37	<0.001
Protective clothing	2.73	1.23	3.10	1.24	<0.001
Total	15.01	4.47	16.65	4.37	<0.001

<sup>a</sup> Mean response of 182 respondents to the following questions: Within the past month how often have you... regularly used sunscreen; limited your time in the sun from 11 a.m. to 3 p.m.; stayed in the shade; wore a hat; and worn long-sleeved or other sun-protective clothing? Responses were measured on a scale of 1 to 5, where 1 = "almost never", 2 = "seldom", 3 = "sometimes", 4 = "often", and 5 = "almost always".

**Table 3.** Preventive Health Behaviors Before and After NMSC Treatment<sup>a</sup>

General Health Behaviors	Pre-surgery		Post-surgery		P-value
	Mean	SD	Mean	SD	
Skin self-exams	2.81	1.27	3.14	1.18	<0.001
Alcohol consumption (reverse coded)	3.26	1.09	3.31	1.08	0.340
Tobacco use (reverse coded)	4.63	1.00	4.65	1.00	0.514
Exercise	3.54	1.24	3.51	1.32	0.700
Healthy diet	3.86	0.86	3.81	0.91	0.362

<sup>a</sup> Mean response of 182 respondents to questions about the frequency of participation in the following: skin self-exams; alcohol consumption; tobacco use; exercising at least 3 times per week; and eating a low-fat, high fiber diet. Responses were measured on a scale of 1 to 5, where 1 = "never", 2 = "seldom", 3 = "sometimes", 4 = "usually", and 5 = "always".

unemployed counterparts, and the societal endorsement of tanned skin as "healthy" and "attractive" has been shown to be an important motivating factor for seeking a tan and ignoring skin cancer warnings.<sup>15</sup>

Surprisingly, NMSC patient risk perceptions of developing future melanomas were low and did not change following treatment. A recent study revealed that the risk of NMSC patients developing cutaneous melanoma within 4 years were on average 3.45%, which is notably more than the incidence in the US general population during that same 4-year period (0.0152%).<sup>3</sup> NMSC patients in this study exclusively perceived themselves at higher risk for future NMSCs, not for melanoma. Despite the fact that sun exposure is the most preventable risk factor for both melanoma<sup>16</sup> and NMSC, patients do not seem to draw this connection. It appears that patients consider melanoma differently than NMSC and do not perceive themselves at greater risk. This finding points to a need for targeted counseling and better education of this patient cohort that is at higher risk for melanoma. Furthermore, perhaps a broader education of the public of the link between these 2 types of skin cancers is warranted.

Disease-specific QoL as measured by the Skin Cancer Index (SCI) was not predictive of behavior changes following surgery. Patients who associated NMSC with poorer QoL were expected to have greater risk perception and thus exhibit greater change in behavior; however this was not found to be the case. QoL showed no correlation with changes in sun-protective behaviors. It may be concluded that risk perception is not appreciably influenced by disease-specific QoL and that these 2 outcomes, though possibly overlapping to some degree, are essentially measuring different concerns and dimensions.

There was no significant post-treatment change in general preventive health behaviors unrelated to sun exposure, such as tobacco use, alcohol consumption, exercise, and diet. In a previous study, we demonstrated that NMSC patients who smoked did not quit smoking after treatment, but they were not any less likely to adopt sun-protective behaviors.<sup>10</sup> Maser et al<sup>11</sup> also reported no significant change in general preventive health measures in a similar group of skin cancer patients. Though perhaps not as well known by the public or among health care professionals, studies have reported the

**Table 4A.** Predictors of Main Effects for Sun-Protective Behaviors

Main Effects	Level	Mean (CI)	P-value
Skin tanning ability	Slope	-0.9 (-1.4, -0.3)	0.001
	Season		0.004
	Spring	15.7 (14.7, 16.8)	
	Summer	17.1 (16.0, 18.1)	
	Fall	16.1 (15.1, 17.1)	
	Winter	15.6 (14.4, 16.7)	

Least square estimates of means for main effect variables (no interaction with time) are provided with 95% confidence intervals (CI), and a *P*-value testing the main effect.

**Table 4B.** Predictors of Interactions with Time for Sun-Protective Behaviors

Variable	Level	Pre-surgery Mean (CI)	Post-surgery Mean (CI)	P-value
Employed				0.004 <sup>a</sup>
	No	14.8 (13.6, 16.1)	18.4 (17.2, 19.6)	<0.001 <sup>b</sup>
	Yes	14.7 (13.6, 15.7)	16.6 (15.5, 17.6)	0.001 <sup>b</sup>
	<i>P</i> -value <sup>c</sup>	0.823	0.003	
Comorbid conditions				0.003 <sup>a</sup>
	No	14.2 (12.4, 15.9)	18.1 (16.5, 19.8)	<0.001 <sup>b</sup>
	Yes	15.4 (14.7, 16.1)	16.9 (16.1, 17.6)	<0.001 <sup>b</sup>
	<i>P</i> -value <sup>c</sup>	0.170	0.153	
Previous treatment				0.021 <sup>a</sup>
	None	13.4 (12.3, 14.4)	16.8 (15.8, 17.8)	<0.001 <sup>b</sup>
	New site/recurrent	16.1 (14.9, 17.4)	18.2 (16.9, 19.4)	0.002 <sup>b</sup>
	<i>P</i> -value <sup>c</sup>	<0.001	0.036	

For variables having a significant interaction with time, least squares estimates of means and 95% confidence intervals (CI) are provided both pre- and post-surgery for each level of the variable.

<sup>a</sup> The *P*-value testing for interaction.

<sup>b</sup> A *P*-value testing for changes over time is presented for each level of the variable.

<sup>c</sup> A *P*-value testing for differences between levels of the variable is presented for both pre- and post-surgery.

incidence of a second malignancy (both skin and non-skin) in NMSC patients is 15%-30% higher than that of the general population.<sup>7,17</sup> A recent study examining this correlation in Canadian patients found comparable results.<sup>3</sup> Also, numerous studies have demonstrated that patients with an NMSC history are at an increased risk of cancer mortality.<sup>18-20</sup>

It appears that patients do not see the link between NMSC and other cancers, and their reported behaviors reflect this perception. This does raise some interesting questions for health care professionals and public health officials. In a disease as prevalent as NMSC, there is an opportunity to educate and motivate behavioral change in a potentially “vulnerable” patient population. The evidence linking melanoma and NMSC appears to be strong, and education about the shared risk factors and encouragement for skin examination appears to be warranted. Our study findings indicate that patients do need further education about the link between the 2 skin cancer types.

Frisch et al,<sup>7</sup> in their study of basal cell cancer patients, concluded that although the increase in abso-

lute risk for noncutaneous cancer did not appear large enough to justify general screening for noncutaneous cancers, certain symptoms and signs relating to possible other cancers should be taken seriously in young patients who have had basal cell cancer. However, it is less clear how best to convey to patients this potential link between NMSC and non-skin cancers from a preventive health standpoint. The associated risks of non-skin cancer mortality have been described, but potential interventions that could alter the outcome have not been studied. The opportunity to change risk perceptions and motivate preventive health behavior must be weighed against the potential negative mental and emotional health sequela when describing to patients this reported associated risk. Future interventional studies are needed that incorporate general preventive health counseling and education of NMSC patients to measure the effect of these interventions in changing risk perception and behavior while measuring potentially adverse effects of this line of counseling.

Some limitations of this study must be noted. First, these data were derived from patients’ self-reported par-

ticipation in behaviors. Actual patient behaviors may differ from what is being reported by the patients. Also, our cohort consisted almost exclusively of Caucasian Midwesterners. Racial and ethnic differences in sun habits have been previously reported,<sup>21-22</sup> and future studies should include a larger geographic area with a more diverse patient population. Furthermore, we did not include a comparison cohort; it may be interesting to compare risk perceptions and behaviors of NMSC patients to patients with other cancers as well as to individuals without cancer. Finally, a cohort of patients with greater disease severity (larger cancers, squamous cell histology, underlying immunosuppression) or less severity (basal cell cancers not needing Mohs surgery) may potentially prove to have different risk perceptions and preventive health behaviors.

## CONCLUSIONS

NMSC patients are willing to improve sun-protective behaviors following surgery, and we have described certain factors that may predict higher likelihood of greater participation. However, NMSC patients do not perceive an increased risk for melanoma or for other non-skin cancers. Although patients change their sun-protective behaviors following surgery, they do not alter other potentially unhealthy aspects of lifestyle. Additional studies are needed to explore the potential impact of counseling or education about the link between NMSC and melanoma and other non-skin cancers.

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